

A review of *Lagenophora* Cass. (Astereae: Asteraceae) in Queensland, Australia

Jian Wang & A.R. Bean

Summary

J.Wang & A.R.Bean (2016). A review of *Lagenophora* Cass. (Astereae: Asteraceae) in Queensland, Australia. *Austrobaileya* 9(4): 463–480. Five species of *Lagenophora* occur in Queensland. These include the two named species *L. gracilis* Steetz, a widespread and variable species; and *L. stipitata* (Labill.) Druce, known only in Girraween National Park. Three new species are here described; *L. queenslandica* Jian Wang ter & A.R.Bean, *L. fimbriata* Jian Wang ter & A.R.Bean and *L. brachyglossa* Jian Wang ter & A.R.Bean. All species are described and illustrated, with maps of their distribution provided. A key is provided to the Queensland species of *Lagenophora*. The conservation status of each species is assessed.

Key Words: Asteraceae, Astereae, *Lagenophora*, *Lagenophora brachyglossa*, *Lagenophora fimbriata*, *Lagenophora gracilis*, *Lagenophora queenslandica*, *Lagenophora stipitata*, Australia flora, Queensland flora, taxonomy, new species, identification key, illustrations, distribution maps

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Introduction

Lagenophora Cass. is a Gondwanan genus occurring in southern South America, New Zealand, New Caledonia, Australia and Malesia (Java, New Guinea), with one species extending to mainland Asia. All members of the genus are superficially similar, being herbaceous plants with mainly rosulate leaves; the scapes bear a single radiate capitulum, with white to mauve ligules.

In her revision of Australian *Lagenophora* (under the name *Lagenifera*), Davis (1950) accepted just two species for Australia, and only one (*L. stipitata* (Labill.) Druce) in Queensland. Her taxonomy was evidently strongly influenced by the conclusions of Bentham (1866), who similarly recognised just two species for Australia. Both Bentham (1866) and Davis (1950) regarded *L. gracilis* Steetz as a synonym of *L. stipitata*.

Cabrera (1966) in his revision of the genus considered that there are three species in Australia; *Lagenophora huegelii*, *L. stipitata* (with two varieties, var. *stipitata* and var. *montana*), and *L. gracilis*. He cited some *L.*

gracilis specimens collected in Queensland, but did not record any other species from the state.

Stanley & Ross (1986) listed *L. gracilis* as the only species occurring in south-eastern Queensland, but in more recent years, several Queensland *Lagenophora* specimens lodged at BRI were identified as *L. stipitata*, and a single specimen from northern Queensland was given a phrase name, i.e. *Lagenophora* sp. (Forty Mile Scrub R.J.Fensham 1113), indicating it was believed to be an undescribed taxon (Holland & Bean 2015).

The current authors accept that both *L. gracilis* and *L. stipitata* occur in Queensland (the latter of very restricted distribution in the state), together with three new species described herein, viz. *L. brachyglossa*, *L. fimbriata* and *L. queenslandica*.

Lagenophora is closely related to *Solenogyne* Cass., a genus of very similar habit, but differing by the non-ligulate outer florets and the glabrous eglandular achenes without a beak. Drury (1974) determined that all *Solenogyne* species and the *gracilis* group of *Lagenophora* (*L. gracilis*, *L. huegelii* and *L. lanata*) form a taxonomic entity, which he suggested could be a section of *Lagenophora*.

Recent molecular studies of these genera have supported Drury's thesis that *Lagenophora*, as currently circumscribed, is paraphyletic (Nakamura *et al.* 2012; Sancho *et al.* 2014). Monophyly could be restored by either making *Solenogyne* a synonym of *Lagenophora*, or by transferring the species of the *L. gracilis* group to the genus *Solenogyne*. The three species described here also belong to the *L. gracilis* group, and hence these may potentially be transferred to *Solenogyne*. However, no attempt has been made in this paper to alter the generic circumscription. We feel that more molecular markers need to be examined before a decision is made on the generic circumscription.

Materials and methods

This paper is based on morphological examination of *Lagenophora* material at BRI, and specimens received on loan from MEL and NSW. All species except *L. queenslandica* were examined in the field in 2014, 2015 and 2016. Three individuals of *L. queenslandica* from Shoalwater Bay and cultivated in Brisbane in 2016 were also examined. Most measurements are based on dried material, but the dimensions of florets are based on material preserved in 70% alcohol, or reconstituted with boiling water. Common abbreviations in the specimen citations are FR (Forest Reserve), NP (National Park), SF (State Forest).

Taxonomy

Lagenophora Cass., *Bull. Sci. Soc. Philom. Paris* 1816: 199 (Dec 1816) ('*Lagenifera*') (*orth. cons.*). **Lectotype:** *Lagenophora billardiarei* (= *L. stipitata*), *fide* A. Cunningham (1839:126).

Small perennial herbs, with stolons or rhizomes. Stem rudimentary or occasionally elongated. Basal leaves rosulate or occasionally alternate, obovate or oblanceolate, penninerved, dentate to lobed. Scapes unbranched, ribbed when dry, with leafy bracts scattered throughout. Head solitary, radiate. Involucre campanulate to hemispherical with 2–4(–6) rows of involucre bracts; bracts herbaceous, linear-lanceolate to oblanceolate, acute to obtuse, with narrow, scarious margins. Ray florets in 2–5 rows, pistillate, ligulate, white to purple. Disk florets bisexual but functionally male, with 5-dentate, tubular corolla. Anthers obtuse at base. Style 2-branched, papillose on the outer surface. Receptacle flat to hemispherical, glabrous. Achenes laterally flattened, obliquely obovate to oblanceolate or lunate, with thickened margins, and with a short to long glandular beak. Pappus absent.

17 species in Australia, New Caledonia, Malaysia (Java, New Guinea), New Zealand, South America and Asia. Five species in Queensland.

Key to the Queensland species of *Lagenophora*

- 1 Plant usually with stolons (roots fibrous); roots not bunched; scape hirsute, retrorse to patent; mature achene dark or reddish brown (**Fig. 9 (1)**) **1. *L. stipitata***
1. Plant with rhizome only (roots fleshy); roots usually bunched; scape hairs appressed, antrorse; mature achene light brown or yellowish brown **2**
- 2 Leaves glabrous on surface but with fimbriate margins; involucre more than 1 cm diameter with 52–62 disc florets, ligule > 3 mm long **4. *L. fimbriata***
2. Leaves usually more or less hairy; involucre up to 1 cm diameter with 10–30 disc florets; ligule < 3 mm long **3**
- 3 Ligule 0.4–0.6 mm long; achene 3.2–3.7 mm long excluding beak **5. *L. brachyglossa***
3. Ligule 1.5–3.5 mm long; achene 2–3 mm long excluding beak **4**

- 4 Achene glands confined to dorsal side of beak and adjacent area of body (Fig. 2); achene usually with one to few hairs at base; achene beak 0.4–0.6 mm long, with a thickened white annular collar at its apex **2. *L. gracilis***
4. Achene glands extending from distal end to base, especially along dorsal side; hairs absent from base of achene; achene beak usually 0.2–0.3 mm long, without a thickened white annular collar at its apex **3. *L. queenslandica***

1. *Lagenophora stipitata* (Labill.) Druce, *Rep. Bot. Soc. Exch. Club Brit. Isles* 4: 630 (1917); *Bellis stipitata* Labill., *Nov. Holl. Pl. Sp.* 2: 55, t. 205 (1806); *Lagenophora billardierei* Cass., *Dict. Sci. Nat. ed. 2*, 25: 111 (1822), *nom. illeg.*; *Lagenophora stipitata* var. *stipitata*, Domin, *Biblioth. Bot.* 89: 653 (1929). **Type:** Tasmania. “Habitat in capite Van-Diemen”, in 1792 or 1793, *J.H.H. de Labillardière s.n.* (lecto: FI 006144 [here chosen]; isolecto: M 0029701, P 00742956).

Herb with stolons, roots wiry, not bunched, 0.1–1 mm diameter; stems to 23 cm long. Leaves 5–20, narrowly obovate to spatulate, 1.5–7.7 cm long, 0.4–1.8 cm wide (3.8–4.3 times longer than wide), sessile or with a winged petiole to 2 cm long, apex obtuse, margins sinuate, with 5–15 lobes, each 1–3 mm long. Upper leaf surface green, with 7–9 eglandular hairs per mm², each 0.2–0.35 mm long. Lower leaf surface pale green, with 7–9 eglandular hairs per mm², each 0.2–0.35 mm long. Leaf margins with 10–15 eglandular hairs per mm², each 0.2–0.3 mm long. Scares 1–5 per plant, each 4–15 cm long at anthesis, 5–19 cm long at fruiting stage, 0.5–1.2 mm diameter, with 1–3(–5) bracts, each up to 8 mm long, c. 1 mm wide. Scape indumentum dense at midpoint (2–10 hairs per mm), equally dense throughout or denser towards apex; hairs spreading or retrorse to patent, 0.2–0.4 mm long. Involucre c. 6 mm long, 8–12 mm diameter; involucre bracts 50–60 in 5–6 rows, outer bracts shorter than the inner bracts, linear to narrow lanceolate, entire, apex acute to occasionally acuminate; inner bracts c. 3.5 × 0.4 mm, outer bracts c. 2.1 × 0.3 mm, all with hairs along the midrib. Receptacle hemispherical, 2–3.2 mm diameter and 1.2–1.5 mm long. Ray florets 40–70, in 2–4 rows, female; tube 0.7–0.9 mm long, c. 0.3 mm diameter with minute hairs; stigma

2-branched, each branch c. 0.5 mm long; ligule 2.3–3.3 mm long, 0.3–0.5(–0.8) mm wide, with 3 longitudinal veins, blue, purple or light yellow. Disc florets c. 15, functionally male, corolla yellow-green, tube 2–2.5 mm long, outer surface glandular near base part and short hairy near apex; lobes 5, deltate, purplish brown, 0.2–0.3 mm long, with minute hairs. Achenes obliquely oblanceolate, laterally compressed, 2.2–3 × 0.7–0.9 mm excluding beak, dark or reddish brown at maturity, with glands extending from distal end to base, especially along dorsal edge, but mainly basal and near apex; hairs absent from base of achene; achene beak 0.6–1 mm long, 0.15–0.25 mm wide, densely glandular throughout, with a thickened white annular collar at its apex, 0.25–0.3 mm diameter. **Figs. 1, 9(1).**

Additional selected specimens examined: Queensland. DARLING DOWNS DISTRICT: Head of Racecourse Creek, Girraween NP, Mar 2009, *Holmes 245 & Holmes* (BRI); 250 m south of “L” junction, Girraween NP, Jan 2016, *Bean 32691 & Wang* (BRI, MEL); between “K” junction and “L” junction, Girraween NP, Jan 2016, *Bean 32695 & Wang* (BRI, NSW); “Z” junction, Girraween NP, just west of Bald Rock, Jan 2016, *Bean 32719 & Wang* (BRI). **New South Wales.** NORTHERN TABLELANDS DISTRICT: Upper slopes of Bald Rock, Bald Rock NP, N of Tenterfield, Dec 2015, *Bean 32542* (BRI); Warra SF, E of Llangothlin at Crown Mountain FR entrance, Feb 1995, *Hunter 2715 et al.* (BRI). CENTRAL COAST DISTRICT: Macquarie Pass NP, SW of Wollongong, Dec 2000, *Bean 17159* (BRI). **Victoria.** Wilsons Promontory NP, dunes in the NW corner, Nov 1980, *Heyligers 80184* (MEL).

Distribution and habitat: *Lagenophora stipitata* is a widespread species occurring in New South Wales, Queensland, South Australia, Tasmania and Victoria. In Queensland, it is confined to Girraween National Park, and within that park, it occurs only in the higher altitude and higher rainfall areas (Map 3). It has also been reported from near Auckland in New Zealand (Drury 1974).

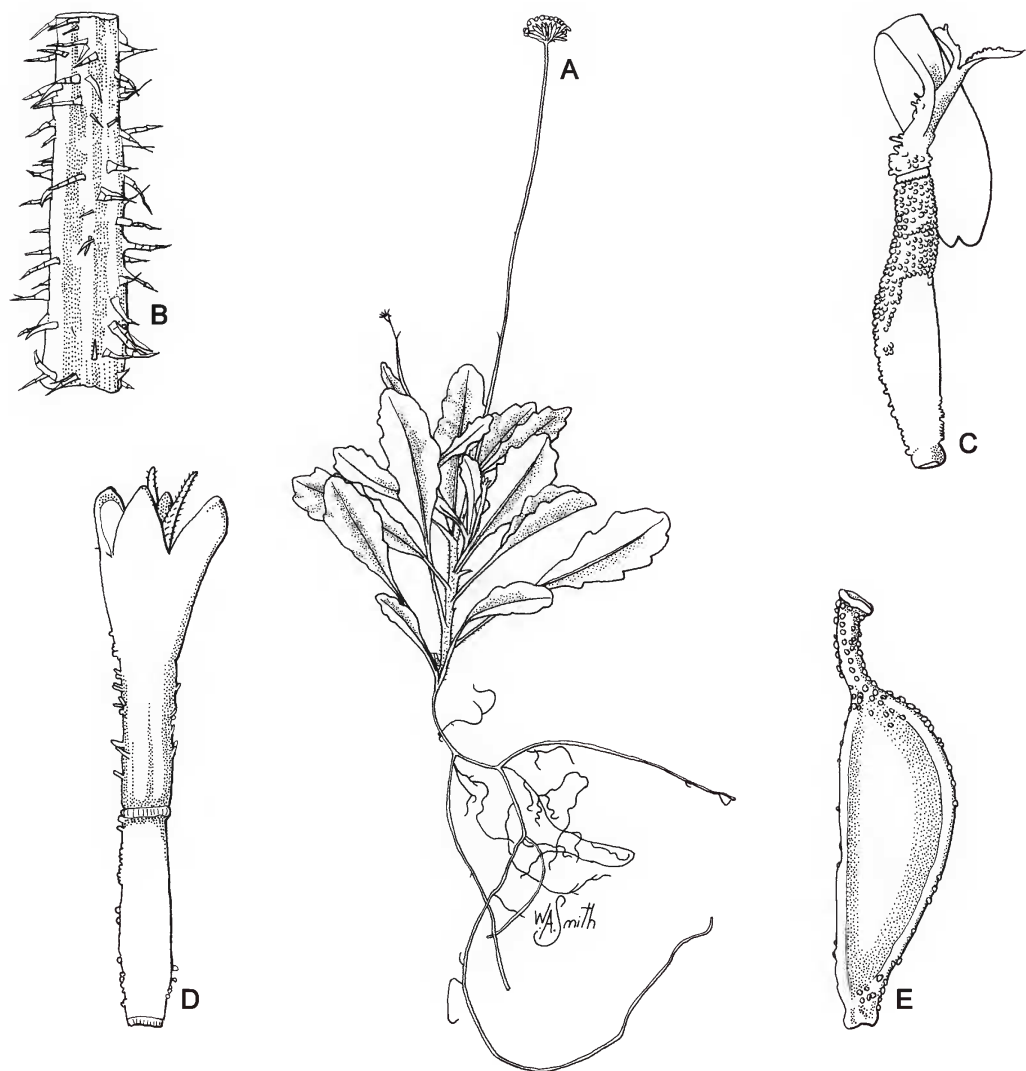


Fig. 1. *Lagenophora stipitata*. A. habit of whole plant with flowering and fruiting inflorescences $\times 0.5$. B. mid-section of scape $\times 16$. C. marginal floret $\times 16$. D. disc floret $\times 16$. E. achene $\times 16$. A from *Bean 32695 & Wang* (BRI); B–E from *Bean 32719 & Wang* (BRI). Del. W. Smith.

Its habitat in Queensland is tall wet sclerophyll forest dominated by *Eucalyptus campanulata* R.T.Baker & H.G.Sm. and *E. deanei* Maiden, with an understorey of *Acacia* spp. and various ferns. *Lagenophora stipitata* may co-occur with *L. gracilis* in Queensland.

Phenology: In Queensland, flowers are recorded in January and March; fruits in January and March. In New South Wales, South Australia, Tasmania and Victoria, the species flowers from September to March and fruits from November to April.

Typification: It can be argued that Davis (1950) did not choose a lectotype for *Bellis stipitata*. Although she discussed the sheet that is here designated as the lectotype, she referred to it as a “syntype series” presumably as it consists of 11 elements, but according to the Code of Nomenclature (McNeill *et al.* 2011) it is to be regarded as a single specimen.

Conservation status: Although *Lagenophora stipitata* is so far recorded from only two locations in Girraween National Park, it has a wider distribution in the southern states of Australia. Therefore, it is not considered to be threatened and a **Least Concern** conservation status is recommended based on the IUCN (2012) criteria.

2. *Lagenophora gracilis* Steetz in Lehmann, *Plantae Preissianae* 1: 431 (1845). **Type:** Western Australia. King George Sound, *J.S. Roe s.n.* (?W, *n.v.*).

Herb with rhizomes, roots fleshy, bunched, 0.5–1.5 mm diameter; stem absent or up to 5 mm long. Leaves 4–16, obovate, oblanceolate or elliptical, 2–9 cm long, 0.8–2.2 cm wide (2.5–4.1 times longer than wide), sessile or with a winged petiole to 1 cm long, apex obtuse, margins finely serrate or dentate, with 5–19 teeth, each 0.2–2 mm long. Upper leaf surface green, with 0–7 eglandular hairs per mm², each up to 0.3 mm long. Lower leaf surface pale green, with 0–8 eglandular hairs per mm², each up to 0.3 mm long. Leaf margins with 5–12 eglandular hairs per mm², each 0.2–0.4 mm long. Scapes 1–7 per plant, each 4–19 cm long at anthesis, 6–31 cm long at fruiting stage, 0.5–0.6 mm diameter, with 1–6 bracts, each 1–10 × 0.2–0.5 mm.

Scape indumentum of 2–10 hairs per mm at midpoint of scape, rather more dense towards apex; hairs antrorse, more or less appressed, *c.* 0.1 mm long. Involucre 4–5(–6) mm long, 6–8(–11) mm diameter; involucre bracts 20–40 in 3–5 rows, glabrous, outer bracts shorter than the inner bracts, oblong to obovate, apex obtuse, with fringed margin on distal part, inner bracts 2.1–2.6 × 0.5–0.7 mm, outer bracts 1.2–1.9 × 0.3–0.6 mm. Receptacle hemispherical, *c.* 2.7 mm diameter and *c.* 1 mm long. Ray florets 20–37 in 2–5 rows, female; tube *c.* 0.5 mm long × 0.1–0.15 mm diameter, with minute hairs; stigma 2-branched, each branch 0.3–0.4 mm long; ligule 2.1–2.2 mm long, 0.3–0.4 mm wide, white to mauve. Disc florets 10–20, functionally male, corolla light yellow, tube 1.5–1.9 mm long, outer surface with sparse minute hairs; lobes 5, deltate, 0.1–0.2 mm long. Achenes obliquely oblanceolate, laterally compressed, 2.4–2.8 × 0.6–0.8 mm excluding beak, light brown to brown at maturity, with glands confined to dorsal side of beak and adjacent area of achene; 1–3 hairs usually present at base of achene; achene beak 0.4–0.6 mm long, with a thickened white annular collar at its apex, 0.2–0.25 mm diameter. **Figs. 2, 9(2).**

Additional selected specimens examined: Queensland.

COOK DISTRICT: Speewah, upper Clohesy River, Mar 1948, *Brass 18215* (BRI); Daintree NP, Adeline Creek headwaters, ridge to Hill 929, May 1999, *Forster PIF24527 & Booth* (BRI, MEL); Hann Tableland, NW of Mareeba, May 2004, *McDonald KRM2465 & Ford* (BRI); 11.5 km NW of Mt Molloy, Gnana Kukul trail, slopes of Mt Lewis/Fraser, Brooklyn, Jun 2007, *Kemp JEK10208 & Kutt* (BRI). NORTH KENNEDY DISTRICT: SF 511, NW of Ravenshoe, Mar 2004, *McDonald KRM1800* (BRI); Taravale near Hell Hole Creek, 0.5–1 km E of homestead, Mar 1987, *Jacks 8703* (BRI); Lot 5, Webster Road, S of Wondecla, Apr 2004, *McDonald KRM2112* (BRI); Kirrama SF, Mar 1985, *Crowley 7* (BRI). SOUTH KENNEDY DISTRICT: Schumanns Road, *c.* 1.1 km E of Swampy Ridge radar installation, W Eungella, Jun 1995, *Pollock 238* (BRI); Snake Road, SF 62, at locked gate, NE of Eungella township, Feb 2003, *Bean 20045* (BRI). LEICHHARDT DISTRICT: Blackdown Tableland, *c.* 32 km SE of Blackwater, Apr 1971, *Henderson 629 et al.* (BRI); Carnarvon Gorge, Carnarvon NP, NW of Injune, Apr 1994, *Morley s.n.* (BRI [AQ471673]); SF 35, Bigge Range, NW of Taroom, Nov 1998, *Forster PIF23920 & Booth* (BRI). PORT CURTIS DISTRICT: On upper ridge but below final peak, Mt Larcom, Mar 1966, *Curtis s.n.* (BRI [AQ930489]); 10 km SE of Forestry Camp, Kroombit Tops, Dawes Range, 64 km SW of Calliope, Dec 1983, *Sharpe 3421* (BRI); 17.5 km NW of Gladstone, Apr 1997,

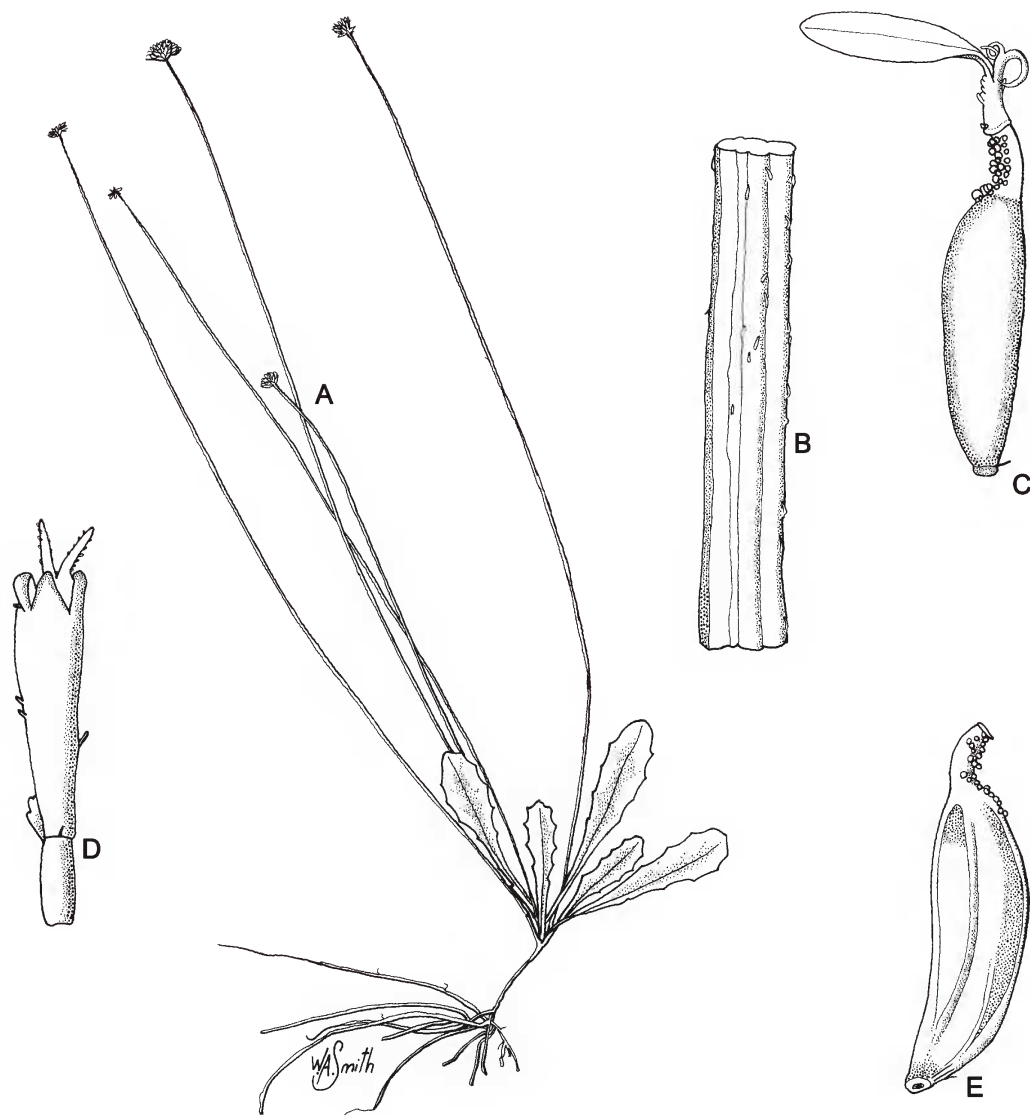


Fig. 2. *Lagenophora gracilis*. A. habit of whole plant with flowering and fruiting inflorescences $\times 0.5$. B. mid-section of scape $\times 16$. C. marginal floret $\times 16$. D. disc floret $\times 16$. E. achene $\times 16$. A from *Bean 19040* (BRI); B–D from *Bean 32689* (BRI); E from *Bean 32713* (BRI). Del. W. Smith.

Thompson GLA67 (BRI). BURNETT DISTRICT: Bania SF, N of Mt Perry, Mar 1995, *Bean 8500* (BRI); Gorge Oak LA, Coomingleh SF, NW of Monto, Jun 1996, *Bean 10416* (BRI). WIDE BAY DISTRICT: Groggee Mt, Main Range, about 20 km S of Glastonbury, near Gympie, Apr 1978, *Sharpe 2330* (BRI); Ridge running E of Como Scarp Road, Cooloola NP, Mar 1986, *Sandercoe 660* (BRI); Compartment 56A, just S of Benarige Creek track junction, SF 57, Parish of St Mary, Mar 1995, *Grimshaw 2041* (BRI). DARLING DOWNS DISTRICT: Mt Colliery area off Gambubal Road, 'Paddy's Gully' adjacent to Main Range NP, Apr 2015, *Forster PIF42568 et al.* (BRI); 170 metres E of "L" junction, Girraween NP, Jan 2016, *Bean 32689 & Wang* (BRI); "Z" junction, Girraween NP, just W of Bald Rock, Jan 2016, *Bean 32713 & Wang* (BRI). MORETON DISTRICT: Diana's Bath area, near Mt Byron, D'Aguilar Range, May 1995, *Forster PIF16479 & Figg* (BRI); Mt Marysmokes, Bellthorpe SF, NW of Woodford, Dec 1998, *Bean 14392* (BRI); Kobbie Creek, c. 3.5 km from Hawkins Road, Samsonvale, Apr 2003, *Phillips 1088 & Phillips* (BRI); Johnson Road, 2 km W of Browns Plains, May 2002, *Bean 19040* (BRI).

Distribution and habitat: *Lagenophora gracilis* is widely distributed, occurring in Asia (e.g. India, Thailand), Malesia (e.g. Java, New Guinea), and Australia (New South Wales, Queensland, South Australia, Tasmania, Victoria and Western Australia). In Queensland, it is found from the NSW border to Gladstone, and a few places further west e.g. Blackdown Tableland, Carnarvon Gorge, then disjunctly further north, e.g. the Eungella plateau near Mackay, between Paluma and Daintree NP, NW of Mossman (**Map 1**). It mainly inhabits eucalypt or *Melaleuca* dominated open forest or woodland on a wide range of soils. It frequently occurs at altitudes exceeding 500 metres, but in the south-east of the state, it may be found near sea level.

Phenology: In Queensland, although flowers and fruits are recorded mainly from November to April, there is a record of flowers in September and fruits in June.

Notes: *Lagenophora gracilis* is a widespread and highly variable species. Its taxonomy and nomenclature will be studied in a future paper. The type of *L. gracilis* has not been located. It was expected to be at W, but recent searches there (A. Löckher, pers. comm.) have failed to reveal it.

Conservation status: **Least Concern** (IUCN 2012).

3. *Lagenophora queenslandica* Jian Wang & A.R.Bean **sp. nov.** with affinity to *L. gracilis*, but differing by the longer hairs on the leaves, the oblong to obovate involucre bracts, and the beak on the achene being shorter and lacking the white annular collar at its apex. **Typus:** Queensland. COOK DISTRICT: 3 km from Mt Molloy on Mareeba road, 12 April 1975, *L.A.Craven 3243* (holo: BRI; iso: CANB n.v.).

Lagenophora sp. (Forty Mile Scrub R.J.Fensham 1113); Holland & Bean (2015).

Herb with rhizomes, roots fleshy, bunched, 0.8–2 mm diameter; stem absent or to 5 mm long. Leaves 4–14, oblong, obovate or elliptical, 2.5–8 cm long, 1.2–2.4 cm wide (2.1–3.3 times longer than wide), sessile or with a winged petiole to 1 cm long, apex obtuse, margins finely serrate or dentate, with 9–17 teeth, each 0.5–1.5(–2) mm long. Upper leaf surface green, with 0–2 eglandular hairs per mm², each 0.3–0.5 mm long. Lower leaf surface pale green, with 0–3 eglandular hairs per mm², each 0.3–0.6 mm long; up to 7 eglandular hairs per mm² along the midvein. Leaf margins with 5–7 eglandular hairs per mm², each 0.1–0.4 mm long. Hairs much longer to 1 mm or more at leaf base. Scapes (1–)3–8 per plant, each 9–17 cm long at anthesis, 11–25 cm long at fruiting stage, 0.6–1.2 mm diameter, with 2–6 bracts, each up to 8 × 1.4 mm. Scape with 4–7 hairs per mm at midpoint, rather more dense towards apex; hairs antrorse, more or less appressed, c. 0.05 mm long. Involucre 4–5 mm long, 6–9 mm diameter; involucre bracts 20–40 in 2–4 rows, glabrous, outer bracts shorter than the inner bracts, oblong to obovate, apex obtuse, with fringed margin on distal part, outer bracts 1–1.6 × 0.4–0.6 mm, inner bracts c. 2.1 × 0.5–0.7 mm. Receptacle hemispherical, c. 2.7 mm diameter and c. 1 mm long. Ray florets 30–40, in 2–5 rows, female; tube c. 0.5 mm long, c. 0.2 mm diameter, with minute eglandular hairs; stigma 2-branched, each branch 0.3–0.5 mm long; ligule 1.4–1.8 mm long, 0.3–0.4 mm wide, white to mauve. Disc florets 18–30, functionally male, corolla light yellow, tube 1.7–1.8 mm long, outer surface with minute eglandular hairs; lobes 5, deltate, 0.1–0.3 mm

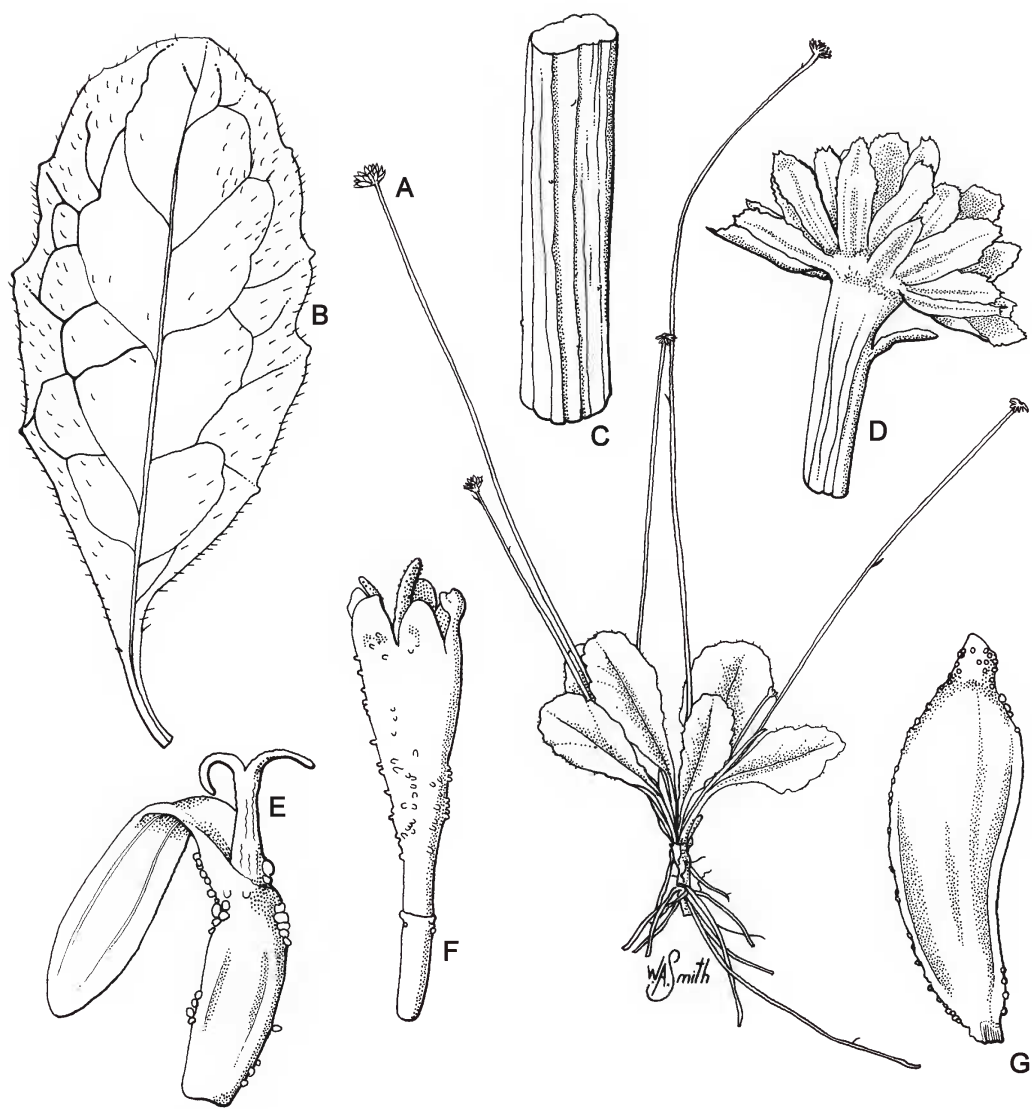


Fig. 3. *Lagenophora queenlandica*. A. habit of whole plant with flowering and fruiting inflorescences $\times 0.6$. B. adaxial leaf surface $\times 2$. C. mid-section of scape $\times 8$. D. capitulum with flowers and fruits removed, lateral view $\times 6$. E. marginal floret $\times 24$. F. disc floret $\times 16$. G. achene $\times 16$. A & E from *Halford QM939* (BRI); B & D from *Champion 1033 et al.* (BRI); C, F & G from *Bean 11955* (BRI). Del. W. Smith.



Fig. 4. Flowering head of *Lagenophora queenslandica* (Mathieson MTM2348, BRI). Photo: M.T. Mathieson.

long; sterile ovary 0.6–0.9 mm long. Achenes obliquely oblanceolate, laterally compressed, $2\text{--}3 \times 0.6\text{--}1.2$ mm excluding beak, light brown to brown at maturity, with glands distributed from distal end to base, especially along dorsal edge; hairs absent from base of achene; achene beak 0.2–0.3 (–0.4) mm long and 0.2–0.3 mm wide, densely glandular throughout, lacking a thickened white annular collar at its apex. **Figs. 3, 4, 9(3).**

Additional selected specimens examined: Queensland.

COOK DISTRICT: Portland Roads, Jun 1948, *Brass 18995* (BRI); Byerstown Range, Feb 2016, *McDonald KRM17663* (BRI); Brooklyn H near Rifle Creek/Luster Creek junction, Jan 1996, *Godwin MGC4202* & *Russell* (BRI); 9.1 km from Forsyth pub along Einasleigh Road, near Mt Talbot turnoff, Feb 2011, *McDonald KRM10591* (BRI); 19 km E of Kennedy Highway along Tinaroo Creek Road, 0.9 km W of road junction, Apr 2003, *Neldner 4206* (BRI); 500 m W of MBA [Mareeba] – Mt Molloy Road opp. Hodzic Road, Mar 2002, *Thompson SLT2563* & *Newton* (BRI); E of Cobra Creek between Tinaroo Falls & Malone Road turnoff on Cairns Road, Feb 1962, *Webb 5875* & *Tracey* (BRI). NORTH KENNEDY

DISTRICT: Forty Mile Scrub NP, Mar 1993, *Fensham 1113* (BRI); 37.4 km by road to Princess Hills, from junction with Kennedy Highway near Mt Garnet, Jan 2005, *McDonald KRM3589* (BRI); White Mountain NP near Warang, Apr 2000, *Wannan 1747* (BRI, NSW, MEL). LEICHHARDT DISTRICT: Homevale Station, adjacent to paddock fence line track, 3.5 km W of station, Mar 1994, *Champion 1033 et al.* (BRI). MITCHELL DISTRICT: Warang, WNW of Torrens Creek, Apr 1990, *Cumming 9662* (BRI). PORT CURTIS DISTRICT: Eden Bann Road, W of Canoona, Mar 1994, *Bean 7541* (BRI); Neerkool Creek, *s.dat.*, *Bowman s.n.* (MEL 2161644); 1.5 km SW along East–West Road from junction with Elanora track, Razorback Sector, Shoalwater Bay Training area, Feb 2014, *Halford QM939* (BRI); The Springs Sector, Shoalwater Bay Training Area, Dec 2015, *Mathieson MTM2348* (BRI). BURNETT DISTRICT: SF 43, 16.6 km along Hawkwood Road, SW of Mundubbera, Apr 1997, *Bean 11955* (BRI); Near regrowth experiment, Narayen, Nov 1969, *s. coll.* (BRI [AQ583268]).

Distribution and habitat: *Lagenophora queenslandica* is endemic to central and north Queensland. Most records are from coastal and near-coastal areas from Mareeba to Rockhampton, but there are several

occurrences further inland, e.g. White Mountains near Pentland, near Mundubbera, and Springsure. There is also a record from Portland Roads on Cape York Peninsula (**Map 2**). The species usually inhabits *Eucalyptus* open forests and *Melaleuca* woodlands on ridges or alluvial plains. There is also a record from dry rainforest on basalt soil.

Phenology: Flowers and fruits are mostly from January to April. However, there are also records of flower or fruits in October, November, May and June.

Notes: *Lagenophora queenslandica* is of similar appearance to the parapatric *L. gracilis*, but differs by the leaves more consistently obovate (leaf length/width ratio 2.1–3.3 versus 2.5–4.1 for *L. gracilis*); the shorter and broader involucre bracts; the lack of hairs at the base of the achene; the glands on the achene beak distributed throughout (confined to the dorsal side in *L. gracilis*), and the achene beak only 0.2–0.3 (–0.4) mm long (0.4–0.8 mm long for *L. gracilis*), and without the thickened white annular collar at its apex.

Conservation status: *Lagenophora queenslandica* is an occasional or rare species according to collecting notes. However, it is widespread from central-coastal Queensland to the Cape York Peninsula. Therefore, a **Least Concern** conservation status is recommended using the IUCN (2012) criteria.

Etymology: The specific epithet is derived from the state of Queensland in north east Australia. It indicates the general occurrence of this new species.

4. *Lagenophora fimbriata* Jian Wang ter & A.R.Bean **sp. nov.** with affinity to *L. gracilis*, but differing by the glabrous leaf surface, the fimbriate leaf margin, the larger involucre, the longer ligules, the more numerous (at least twice as many) disc florets, and the glands on the achene distributed along dorsal edge from beak to near base. **Typus:** Queensland. MORETON DISTRICT: Purga Nature Reserve, 14 km SSW of Ipswich, 1 December 2015, A.R.Bean 32442 & J. Wang (holo: BRI; iso: BM, CANB, CHR, MEL, NSW, P, US).

Herb with rhizomes, roots fleshy, bunched, 1–2 mm diameter; stem absent or to 5 mm long. Leaves 5–16, oblanceolate, 4–15 cm long, 0.8–2.7 cm wide (5–5.6 times longer than wide), sessile or with a winged petiole to 4 cm long, apex obtuse, margins finely toothed, with 9–23 teeth, each 0.2–1 mm long. Upper leaf surface dark green, glabrous. Lower leaf surface pale green, glabrous. Leaf margins with 3–4 eglandular hairs per mm², each c. 0.3 mm long. Scapes (1–)3–7 per plant, each 10–20 cm long at anthesis, 14–38 cm long at fruiting stage, 0.6–1.2 mm diameter, with 3–7 bracts, each 10–18 × 0.5–2 mm. Scape indumentum very sparse at midpoint of scape (2–5 hairs per mm), rather more dense towards apex; hairs antrorse, more or less appressed, 0.05–0.1 mm long. Involucre 6–10 mm long, 11–14 mm diameter; involucre bracts 24–28 in 2–3 rows, glabrous, outer bracts shorter than the inner bracts, oblong to obovate, apex obtuse, with fringed margin on distal part, outer bracts 1.6–2.1 × 0.6–0.7 mm, inner bracts 2.5–3.5 × 0.7–1 mm. Receptacle hemispherical, c. 2.0 mm diameter and c. 1 mm long. Ray florets 40–50, in 2 rows, female; tube c. 1 mm long and c. 0.3 mm diameter with minute hairs; stigma 2-branched, each branch c. 0.5 mm long; ligule 3–4.7 mm long, 0.5–1.1 mm wide, white to mauve. Disc florets (46–)52–62, functionally male; corolla light yellow; tube 2–2.8 mm long, outer surface with minute hairs; corolla lobes 5, deltate, 0.3–0.4 mm long; sterile ovary 1–1.5 mm long. Achenes obliquely oblanceolate, laterally compressed, 2.8–3.2 × 0.8–1 mm excluding beak, light brown to brown at maturity; achene glands mostly confined to dorsal edge, the density gradually reducing from apex to base; hairs absent from base of achene; achene beak (0.2–)0.4–0.5 (–0.7) mm long, densely glandular on dorsal side, sparsely glandular elsewhere, with a white annular collar at its apex, 0.2–0.3 mm diameter. **Figs. 5, 6, 9(4).**

Additional selected specimens examined: Queensland. BURNETT DISTRICT: E side of road Bungaban, Auburn Range, c. 6.2 km N of Dawson Vale E along road to Rockybar, Mar 1997, Pollock ABP450 & Baumgartner (BRI). BORANIA SF, S of the Eidsvold – Theodore Road, Apr 2015, Forster PIF42379 & Thomas (BRI). DARLING DOWNS DISTRICT: Inglewood, Mar 1911, Boorman s.n.

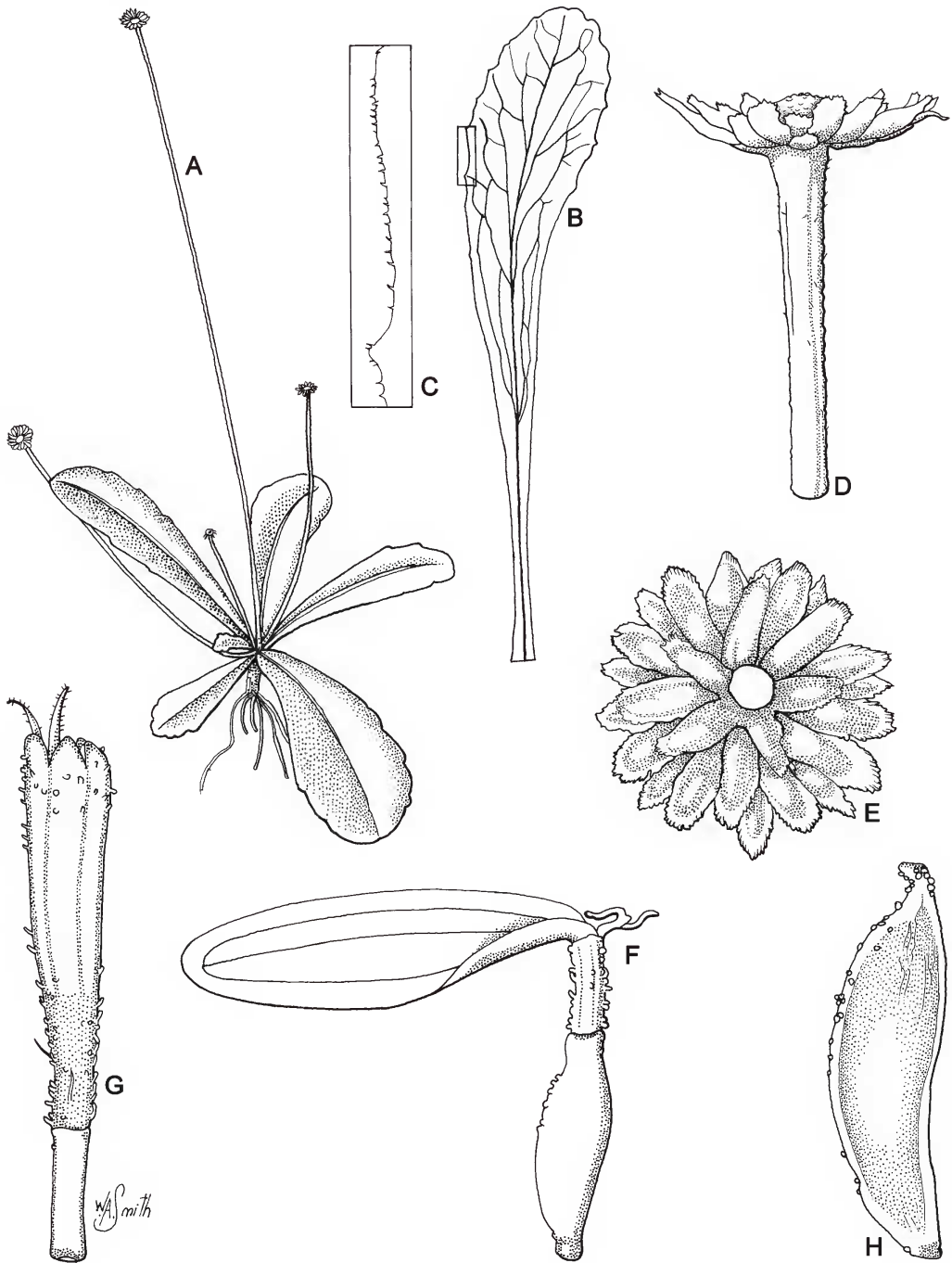


Fig. 5. *Lagenophora fimbriata*. A. habit of whole plant with flowering and fruiting inflorescences $\times 0.6$. B. adaxial leaf surface $\times 1$. C. leaf margin detail $\times 0.6$. D. capitulum with flowers and fruits removed, lateral view $\times 6$. E. abaxial capitulum surface with scape removed $\times 6$. F. marginal floret $\times 16$. G. disc floret $\times 16$. H. achene $\times 16$. All from *Bean 32442 & Wang* (BRI). Del. W. Smith.

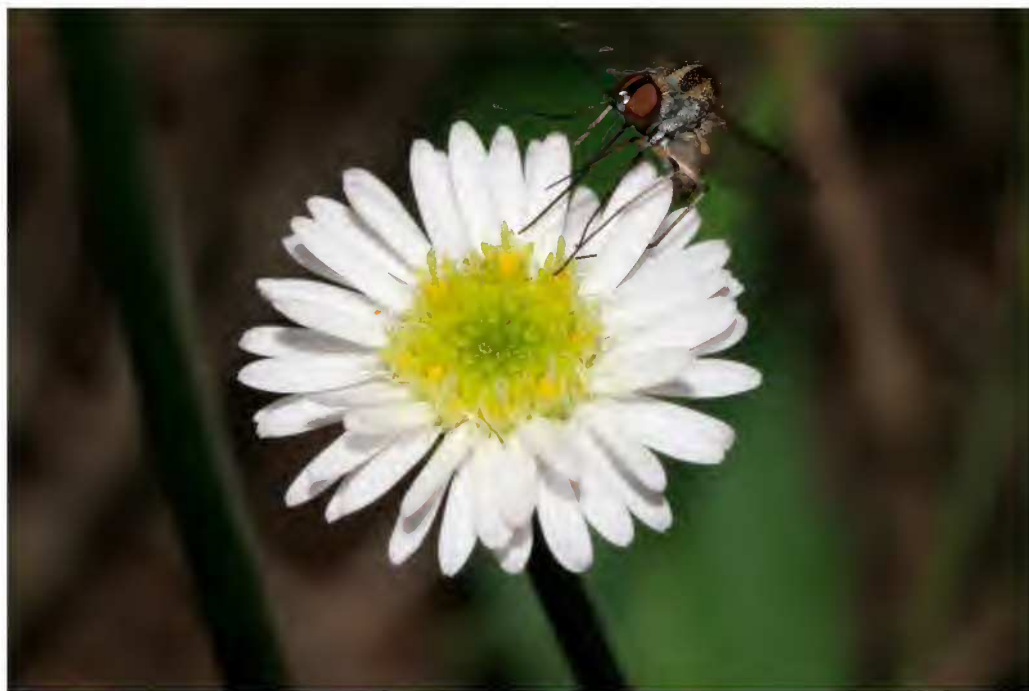


Fig. 6. Flowering head of *Lagenophora fimbriata* (Forster PIF43597 & Leiper, BRI). Photo: G. Leiper.

(NSW 10281); Burraburri Creek, 16 km W of Dulong, May 1992, *Forster PIF9858* (BRI, DNA, MEL); c. 10 miles [16.6 km] S of The Gums, Mar 1959, *Johnson 725* (BRI); Calala, c. 10 miles [16.6 km] E of Meandarra, Jun 1960, *Johnson 1612* (BRI). MORETON DISTRICT: 1.4 km along Champion's Way from Cunningham Highway, Willowbank, c. 12 km SW of Ipswich, Jan 1993, *Jobson 1872* & *Albrecht* (MEL); Champion Way, 1 km N of Cunningham Highway, about 12 km SW of Ipswich, Apr 1991, *Sharpe 5039* & *Bird* (BRI); Near Willowbank Raceway, SW of Ipswich, Apr 1990, *Bean 1526* (BRI); Jimboomba, May 1921, *Cheel s.n.* (NSW 10280); Jimboomba, off Kurrajong Road, Mar 2016, *Forster PIF43597* & *Leiper* (BRI, MEL, NSW).

Distribution and habitat: *Lagenophora fimbriata* is endemic to south east Queensland, extending from near Cracow to Inglewood, and east to Jimboomba (**Map 3**). It inhabits heavy clay soils in flat or gently undulating terrain, in communities dominated by *Acacia harpophylla* F.Muell. ex Benth. (brigalow) and *Casuarina cristata* Miq. (belah), or *Eucalyptus moluccana* Roxb. (gum top box), or *Melaleuca irbyana* R.T.Baker.

Phenology: Flowers mostly from November to April and fruits mainly from March to May. A mass flowering event also recorded in July 2016 by the authors.

Notes: *Lagenophora fimbriata* is of similar appearance to the parapatric *L. gracilis*, but differs by the glabrous leaf surface, the fimbriate leaf margin, the larger involucre 11–14 mm diameter (usually 6–8 mm long for *L. gracilis*), the larger ligules $3\text{--}4.7 \times 0.5\text{--}1.1$ mm ($2.1\text{--}2.2 \times 0.3\text{--}0.4$ mm for *L. gracilis*), the more numerous (at least twice as many) disc florets 46–62 (10–20 in *L. gracilis*), and the glands on the achene distributed along dorsal edge from beak to near base (the glands confined to dorsal side of beak and adjacent area of achene for *L. gracilis*).

Conservation status: Although *Lagenophora fimbriata* has a restricted distributional range in south east Queensland, it can be locally abundant where it occurs. A species survey

by us found that on a 4-hectare property at Jimboomba (Voucher: *Forster PIF43597 & Leiper*), the population size varied from 120 to 190 plants per 100 square metres, with a total of 5000–6000 plants estimated. To date, there are only eight locations where the species has been recorded (**Map 3**). There is evidence that due to urban development and habitat destruction, the species' occupancy area has declined in the past decade. Therefore, a **Vulnerable** conservation status is recommended based on the IUCN (2012) criteria VU B2(a), (b) (iii).

Etymology: From the Latin *fimbriatus*, meaning 'fringed'. This refers to the fimbriate leaf margins of this species.

5. *Lagenophora brachyglossa* Jian Wang & A.R.Bean **sp. nov.** with affinity to *L. gracilis*, but differing by the very short ligule, the longer achene, the glands over the beak and the glands on base of the achene on both ventral and dorsal edges. **Typus:** Queensland. MORETON DISTRICT: 3.2 km along Duck Creek Road, near Lamington National Park, 29 February 2016, *A.R. Bean 32729 & J. Wang* (holo: BRI; iso: NSW).

Herb with rhizomes, roots fleshy, bunched, 0.6–1.6 mm diameter; stem absent or to 5 mm long. Leaves 6–9, oblanceolate to obovate, 3–10 cm long, 0.9–2.5 cm wide (3.3–4 times longer than wide), sessile or with a winged petiole to 2 cm long, apex obtuse, margins crenate to sinuate, with 13–21 teeth, each 0.5–1.5 mm long. Upper leaf surface grey-green, with 3–7 eglandular hairs per mm², each 0.2–0.3 mm long. Lower leaf surface pale green, with 3–7 eglandular hairs per mm², each 0.2–0.3 mm long. Leaf margins with 10–15 eglandular hairs per mm², each 0.2–0.3 mm long. Scapes 2–6 per plant, each 10–16 cm long at anthesis, 9–30 cm long at fruiting stage, *c.* 0.6 mm diameter, with 3–5 bracts, each up to 18 × 3 mm. Scape indumentum at midpoint of scape (4–8 hairs per mm), rather more dense towards apex; hairs antrorse, more or less appressed, 0.1–0.3 mm long. Involucre 4–6 mm long, 6–10 mm diameter; involucre bracts 20–40 in 3 or 4 rows, glabrous, outer bracts shorter than the inner bracts, oblanceolate, apex obtuse,

margin with short hairs on distal part, outer bracts 1–1.8 × 0.5–0.7 mm, inner bracts 2.2–3 × 0.5–0.7 mm, Receptacle hemispherical, *c.* 2.3 mm diameter and *c.* 0.9 mm long. Ray florets 35–45 in 2–4 rows, female; tube 0.2–0.3 mm long, *c.* 0.2 mm diameter, with minute hairs; stigma 2-branched, each branch 0.2–0.4 mm long; ligule 0.4–0.7 mm long, *c.* 0.2 mm wide, bright pink to purple. Disc florets 15–20, functionally male, corolla light yellow, tube *c.* 1.6 mm long, outer surface with a few minute hairs; lobes 5, deltate, *c.* 0.3 mm long; sterile ovary 0.9–1 mm long. Achenes obliquely oblanceolate, laterally compressed, 3.2–3.7 × 0.7–1.1 mm excluding beak, light brown to brown at maturity, with glands sparsely distributed at the base on both ventral and dorsal edges; hairs absent from base of achene; achene beak 0.6–0.8 mm long, densely glandular throughout, with a white thickened annular collar at its apex, *c.* 0.2 mm diameter. **Figs. 7, 8, 9(5).**

Additional selected specimens examined: Queensland. MARANO DISTRICT: Saddler Springs, at spring 5.3 km NNW of homestead, Carnarvon Range, south central Queensland, Jan 2010, *Eddie CPE1791 & Hancock* (BRI). BURNETT DISTRICT: Fig Tree Gully, Bunya Mountains, Jun 2003, *Butler & Fairfax s.n.* (BRI [AQ613294]). DARLING DOWNS DISTRICT: 7 km WNW of Clifton, Feb 1995, *Fensham 1997* (BRI); 23 km SSE of Toowoomba, Feb 1995, *Fensham 2073* (BRI); Allora Mountain, Allora, Nov 2005, *Flessler s.n.* (BRI [AQ724458]); 16 km NNE of Stanthorpe, Mar 2010, *Thompson EJT252B & Brennan* (BRI). MORETON DISTRICT: 3.6 km along Duck Creek road, near O'Reillys guest house, Mar 2001, *Bean 17391B* (BRI). NEW SOUTH WALES. NORTH WEST SLOPES: Oxley Park, Tamworth, Nov 1985, *Hosking s.n.* (NSW 563235, 563552). CENTRAL WESTERN SLOPES: Hoffman Property, near Muswellbrook, May 2003, *James & Corkish s.n.* (NSW 721138). CENTRAL COAST: Kentlyn Road, Campbelltown, Mar 1962, *McBarron 6947* (NSW); Sportsground, Appin, Feb 1967, *McBarron 13928* (NSW). SOUTH WESTERN SLOPES: Tarcutta Hills (Bush Heritage's site), Aug 2004, *Burrows s.n.* (NSW 723815). VICTORIA. Devils Backbone, W of Snowy River, East Gippsland, Mar 1971, *Beaughole 37267* (MEL).

Distribution and habitat: *Lagenophora brachyglossa* is endemic to eastern Australia. It is a relatively widespread species occurring in New South Wales, Queensland and Victoria. In Queensland, it extends from near Stanthorpe and the Lamington Plateau, north-west to the Carnarvon Range. It occurs mainly in the higher altitude and higher rainfall areas (**Map 3**). It usually grows on basaltic clayey



Fig. 7. *Lagenophora brachyglossa*. A. habit of whole plant with flowering and fruiting inflorescences $\times 0.6$. B. adaxial leaf surface $\times 1$. C. leaf margin detail $\times 4$. D. capitulum with flowers and fruits removed, lateral view $\times 8$. E. abaxial capitulum surface with scape removed $\times 8$. F. marginal floret $\times 16$. G. disc floret $\times 16$. H. achene $\times 16$. A, D, E, H from *Butler & Fairfax s.n.* (BRI [AQ613294]); B & C from *Bean 32729 & Wang* (BRI); F & G from *Bean 17391B* (BRI). Del. W. Smith.

soils in open forests and woodland with grassy understorey dominated by variously *Eucalyptus biturbinata* L.A.S.Johnson & K.D.Hill, *E. caliginosa* Blakely & McKie, *E. crebra* F.Muell., *E. eugenioides* Sieber ex Spreng., *E. laevopinea* R.T.Baker, *E. microcorys* F.Muell., *E. moluccana*, *E. orgadophila* Maiden & Blakely, *E. tereticornis* Sm. and/or *Angophora floribunda* (Sm.) Sweet. It may co-occur with *L. gracilis* at some localities in Queensland.

Phenology: Flowers are recorded from November to March; fruits from January to June.

Notes: *Lagenophora brachyglossa* is of similar appearance to the parapatric *L. gracilis*, but differs by the very small ligule $0.4\text{--}0.7 \times 0.2$ mm ($2.1\text{--}2.2 \times 0.3\text{--}0.4$ mm for *L. gracilis*), the longer achene $3.2\text{--}3.7$ mm long excluding beak ($2.4\text{--}2.8$ mm long excluding beak for *L. gracilis*), the glands throughout the beak and the glands on base of both ventral and dorsal edges (the glands confined to dorsal edge of beak and adjacent area of achene for *L. gracilis*). In addition, *L. brachyglossa* lacks hairs at the base of the achene.

Conservation status: Although *Lagenophora brachyglossa* has been noted as occasional on herbarium specimen labels, it is likely to be widespread and easily overlooked due to its seasonal flower and fruiting habit. It is not considered to be threatened and a **Least Concern** conservation status is recommended using the IUCN (2012) criteria.

Etymology: From the Greek *brachy* and *glossus*, meaning 'short-tongued'. This refers to the very short ligules of this species.



Fig. 8. Flowering head of *Lagenophora brachyglossa* (Bean 32729 & Wang, BRI). Photo: A.R. Bean.

Acknowledgements

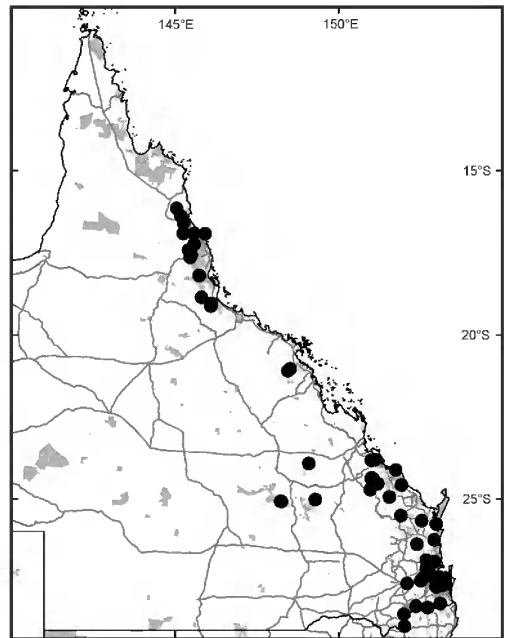
We thank the Directors of MEL and NSW for providing loan specimens, Will Smith for illustrations and distribution maps, Michael Mathieson and Glenn Leiper for photographs of the plants, Greg Keith and staff of Girraween NP for field assistance during our visit to the park, Peter Copping of Logan Shire Council for collecting a specimen of *Lagenophora fimbriata* at our request, and Armin Löckher (W) for searching for the type of *L. gracilis*.



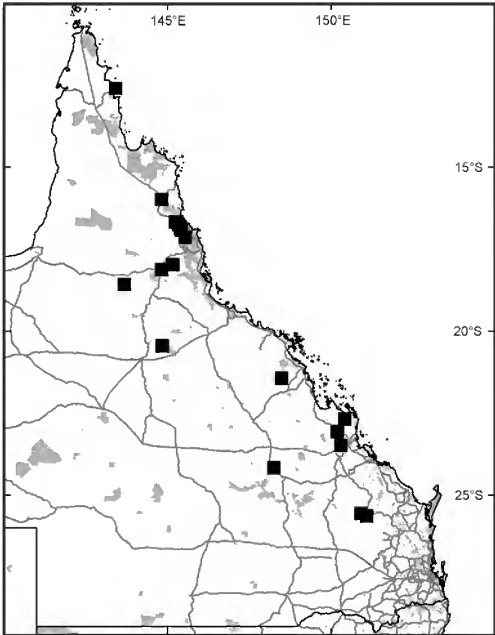
Fig. 9. Achenes of the five Queensland *Lagenophora* species. **1.** *Lagenophora stipitata*, upper Heyligers 80184 (MEL); lower Bean 32695 & Wang (BRI). **2.** *L. gracilis*, upper Bean 32713 & Wang (BRI); lower Pollock 238 (BRI). **3.** *L. queenslandica*, upper Bean 11955 (BRI); lower s. coll. (BRI [AQ583268]). **4.** *L. fimbriata*, upper Bean 32442 & Wang (BRI), lower Johnson 1612 (BRI). **5.** *L. brachyglossa*, upper Bean 32729 & Wang (BRI), lower Butler & Fairfax s.n. (BRI [AQ613294]). Scale bar = 5 mm

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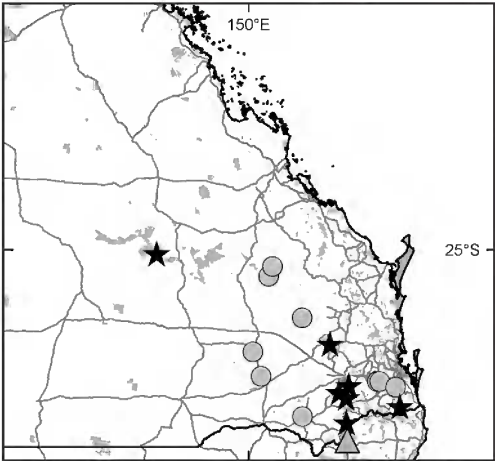
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Map 1. Distribution in Queensland of *Lagenophora gracilis*.



Map 2. Distribution of *Lagenophora queenslandica*.



Map 3. Distribution of *Lagenophora stipitata* ▲ (Queensland records only), *L. fimbriata* ● and *L. brachyglossa* ★.